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A ROCKET-BORNE MEASUREMENT OF INTERSTELLAR DUST EMISSION AT HIGH GALACTIC LATITUDE

A.E. Lange,* D. Alsop,* S. Hayakawa,** T. Matsumoto,**
H. Matsuo,** H. Murakami,** P.L. Richards,* and S. Sato,**

* Dept. of Physics, Univ. of California, Berkeley, California
94720 USA

**Dept. of Astrophysics, Nagoya Univ., Nagoya 464, Japan

We have measured the diffuse brightness of the sky in six submillimeter passbands, using a rocket-borne, liquid helium-cooled, absolute radiometer (Lange et al., 1987). During the flight, the 7.6° field-of-view of the radiometer repeatedly scanned a 31° diameter circle centered at $b=35^\circ$, $l=203^\circ$. In Matsumoto et al (1988) we reported the average brightness observed in each of the passbands, and tentatively identified the dominant source of emission in the three shortest wavelength bands (centered at 102, 137 and 262 μm) as interstellar dust (ISD).

Spatial structure was observed in these bands, as would be expected for emission from the ISD. We have calculated the average column density of HI in each field-of-view along the scan path, using the Bell Laboratories 21 cm survey (Stark et al., 1988). The correlation of submillimeter emission with HI column density is shown in Fig. 1.

All three bands show a significant correlation with HI. The striking degree of correlation of the 137 μm data with HI column density implies that the dust to gas ratio and the dust temperature are extremely constant over this large region of the sky. The ratio of ISD emission to HI column density is 19 ± 4 , 30 ± 5 , and 6 ± 3 $10^{-33} \{ (W/\text{cm}^2\text{sr})/n(\text{HI}) \}$ at 102, 137, and 262 μm , respectively. These values are in excellent agreement with those computed by Draine and Anderson (1985) for a mixture of graphite and silicate grains. The 102 μm value is in good agreement with the range of values reported for the IRAS 100 μm data (Tereby and Fich, 1986).

A significant residual emission, not correlated with the HI column density, is evident in all three channels. The origins of this emission will be discussed elsewhere (Lange et al., 1988).

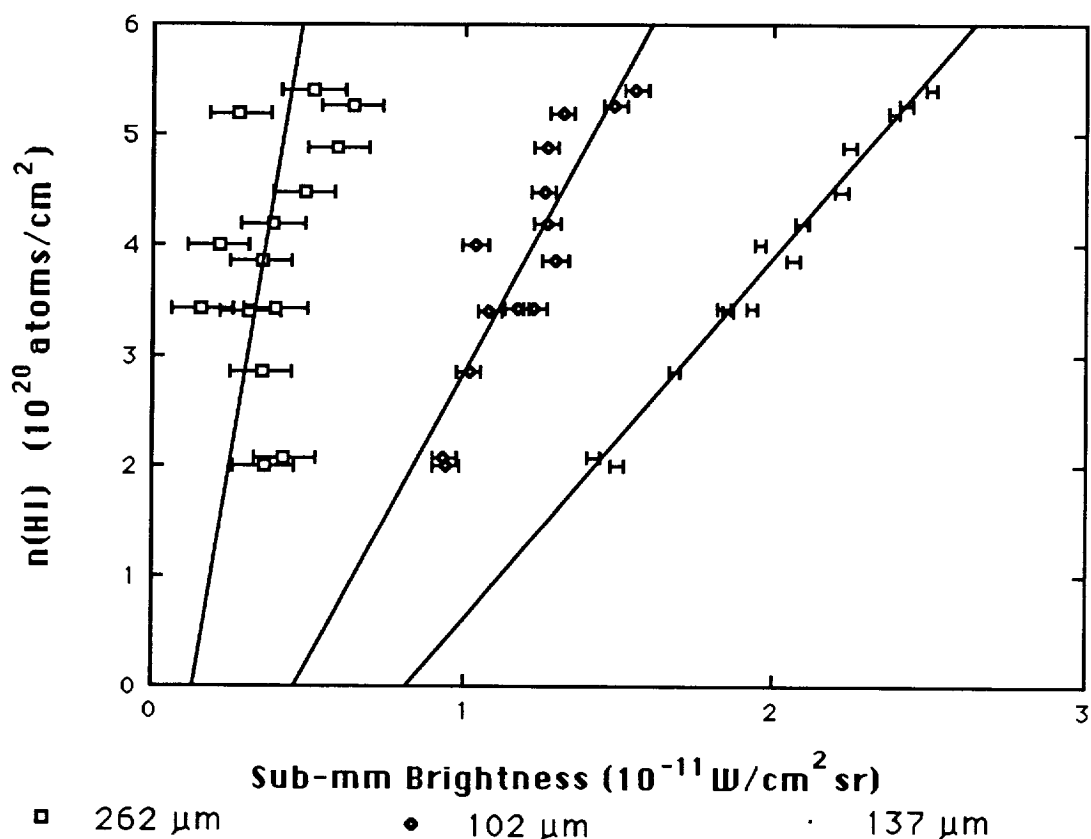


Figure 1. The correlation of HI column density with submillimeter brightness. The horizontal error bars indicate 1σ statistical errors only. The uncertainty in the calibration of the submillimeter data is $\pm 20\%$, $\pm 15\%$, and $\pm 3\%$ for the 102, 137 and 262 μm channels, respectively.

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